

Q.1. Determine the Laplace transform of the following functions

1)  $\sin(2t + \frac{\pi}{3})$

$$= \frac{1 + \frac{\sqrt{3}}{2}s}{s^2 + 4}$$

2)  $u(t-1)$

$$= \frac{e^{-s}}{s}$$

3)  $x(t) = x(t-1) - u(t-1)$

$$= \frac{1}{s^2} - \frac{e^{-s}}{s^2} - \frac{e^{-s}}{s}$$

4)  $t^2 u(t-1)$

$$= \frac{(s^2 + 2s + 2) \cdot e^{-s}}{s^3}$$

5)  $e^{(-2t+3)} \cdot \cos 3t \cdot \sin 4t$

$$= \frac{e^3}{2} \frac{8s^2 + 32s + 88}{(s^2 + 4s + 5)(s^2 + 4s + 5)}$$

Q.2 A system has a response  $y(t) = 4\bar{e}^t + 2\sin(2t) - 4\cos(2t)$

for an input signal  $x(t) = \sin(2t)$ . Determine the transfer function of the system.

$$T(s) = \frac{Y(s)}{X(s)} = \frac{10}{s+1}$$

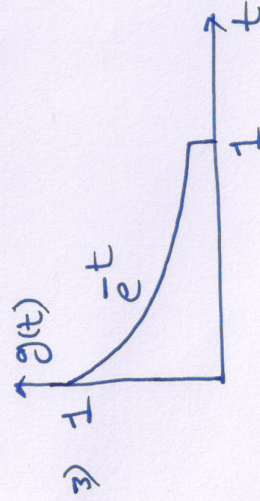
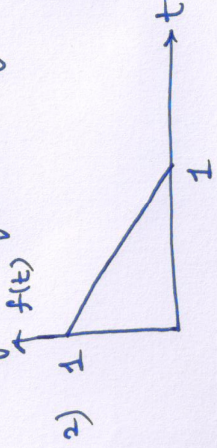
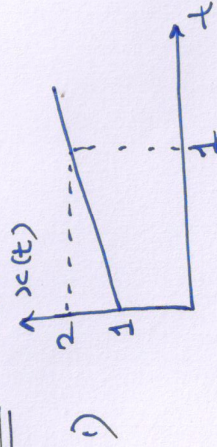
Q.3 Solve the differential equation  $y'' + 4y' + 5y = 5u(t)$

$$y(0) = 1; \dot{y}(0) = 2$$

$$y(t) = [1 + 2e^{-2t} \sin t] u(t)$$

Q.4

Determine the Laplace transform for the following function



1)  $\frac{s-1 + e^{-s}}{s^2}$

2)  $\frac{s+1}{s^2}$

3)  $\frac{1 - e^{-(s+1)}}{s^2}$